National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Exemplar for Internal Assessment Resource

Science Level 1

Resource title: Let's Look at Our Local Area

This exemplar supports assessment against:

Achievement Standard 90952

Demonstrate Understanding of Formation of Surface Features in New Zealand

Exemplifies standard

The moderators have found generic work suitable to be used to exemplify the standard but may not match an A or B assessment resource.

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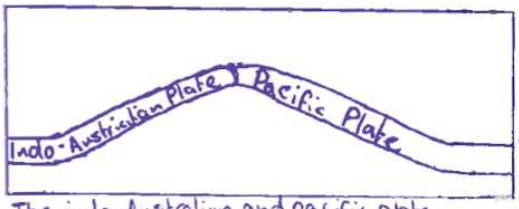
	Grade Boundary: Low Excellence
1.	In this report there has been good links between glacial features and river features. Two external processes shaping the land. There is also the link to plate boundary movement uplifting the mountains in this area. The discussions on the features formed, is at an Excellence level as they are linked to each other.

Mount Aspiring National Park Report

1

Some of the Mount Aspiring National park are; Mount Aspiring, Sharks tooth, the Matukituki and Glaciers. All these features can be explained by Internal and external processes.

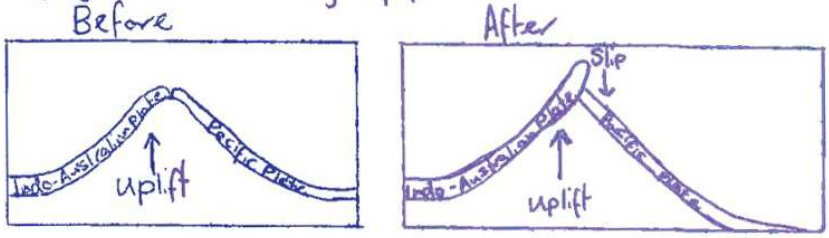
Mount Aspiring has been formed by Internal forces the main one being tectonic plates colliding together.



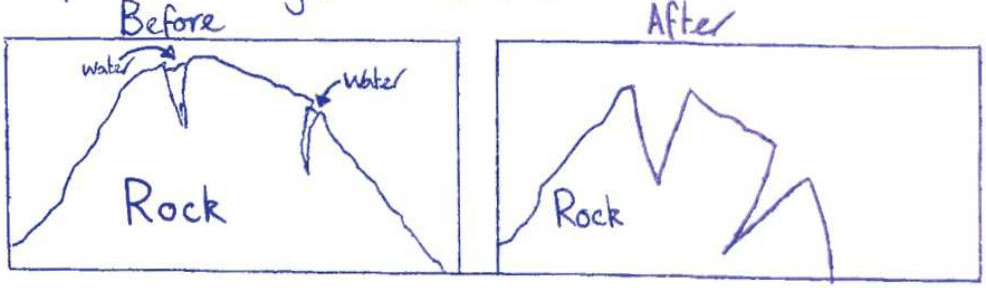
The indo-Australian and pacific plate colliding together to cause Mount Aspiring

But uplift also contributed to the formation of Mount Aspiring. A good example of uplift is Sharks tooth.

Shark tooth is a Mountain that has a scarp in it. This scarp was the result of one tectonic plate sliping down slightly lower than the other. This Slippage was cause by uplift.



At the Peak of Sharks tooth a external process called Freeze thaw occurs. Freeze thaw occurs when water finds its way in little cracks in the rock. When the water freezes it expands causeing the rock to crack.



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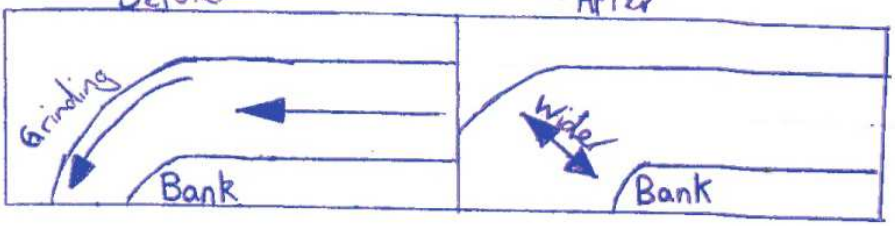
A quite obvious external feature in the mount Aspiring Region is the Matukituki River. This river follows the path that a glacier took thousands of years ago and is coming from the glaciers today. As the water flows it grinds against the valley wall causing it to erode



When the small rocks gets eraded from the Bank the larger rocks sink to the bottom quickly and only the smallest remain. Over years these deposits build up till they are strong enough to change the direction of the water.

Arguable the most stunning surface feature in the Mount Aspiring Region are the glaciers. The glaciers are caused by ice and snow compacting to form a vast slow moving body of ice. Which pushes everything out of its way to create a U shaped valley. Another common features of glaciers are hanging valleys. Hanging valleys occur when a small glacier carves out a valley to meet a larger Glacier.

So in conclusion the Mount Aspiring Region has lot of internal and external processes shaping the feature that we see around us and will always continue to do so.

	Grade Boundary: High Merit
2.	This report explains the formation of the mountains in this area and then discusses the formation of river valleys and glacial valleys. The linking between the two is missing and this linking explains the features in this area. The discussion on metamorphism and the formation of quartz is not required by this standard.

2

Mt Aspiring Science Project

On my trip to Mount Aspiring I noticed many surface features covering the landscape. Some were large like Mount Aspiring and Sharks tooth and others were very small such as the Mica and Quartz minerals. Mt Aspiring is a large mountain formed by uplift in the ground. Two tectonic plates- the Pacific and Indo-Australian plates push together hard until they rise, causing land to form into a mountain. This process happened with Mount Aspiring and Shark's tooth. Mountains like these dominate the landscape

Diagram showing uplift:

Cliffs and scarps are landscape features that are formed when brittle rocks – which are far more likely to break under pressure than normal rocks - will have pressure put on them by tectonic plates, causing them to break. The rocks break along fault lines either horizontally or vertically as seperate blocks. When a large block is raised due to a vertical fault it causes a land feature called a horst. If the opposite happens and the block is lowered it is called a graben (or rift valley). A stream or river can become off-set if the movement is horizontal. An off-set river is when brittle rocks break horizontally and cause the stream to move. Faulting can create cliffs and scarps as well as off-set rivers and streams. Cliffs and scarps are very common in the area. Some cliffs and scarps can become angled. When this happens, we know that folding has occurred in that area of land. Folding is a process similar to the other two mentioned except with folding the tectonic plates push together until they fold up, causing anticlines and synclines in the land.

Diagram showing faulting:

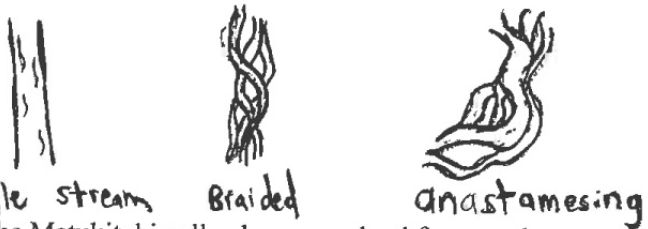
Diagram showing folding:

There are two types of valley in the area, U-shaped and V-shaped. U shaped valleys are formed when a glacier carves out rock in the ground as it expands. The glacier then retreats and a valley shaped like a U is left. V shaped valleys are formed by rivers carving out the rock and carrying alluvium the river creates a valley shaped like a V, hence the term 'V shaped'.

2

Most of the minerals and rocks found in the area are metamorphic. Common minerals and rocks are Mica and Quartz. Mica is found ground up amongst the sand, which gives it a sparkly look, and in the rocks. Due to it's tabular habit, Mica often causes landslips. Quartz is a translucent mineral, the 2nd most common in the world and it can come in many different shapes, sizes and colours depending on how it was formed-
eg. citrine, smokey quartz, agate and sard, which are all forms of quartz.

Rivers play an impotant part in the area. They carve out valleys (see above) and carry alluvium. The alluvium is carried down the river until the river widens out and the water slows down. Alluvium builds up and it is called a shingle fan. There are 3 different types of river: single stream, braided and anastamosing. Single stream rivers are the most common and consist of a single channel of water. Braided rivers are rivers that have many other small channels seperated by areas of sand called sand bars and anastamosing rivers are similar to braided rivers and also the rarest. They have multiple bending channels.
Types of rivers:



In conclusion, the Matukituki valley has many land features that are interesting and exciting to learn about. The valley has changed a lot since it first came to be, but it is no suprise, considering how many things have been going on inside. The Matukituki valley is a great place and hopefully it stays that way.

	Grade Boundary: Low Merit
3.	This report is a Low Merit as it describes external processes – glaciation and river erosion but lacks the link between the two processes. Tectonic processes are mentioned but are not linked adequately to the external processes. The simple explanations of glaciation, river erosion and tectonics, makes this report a Low M.

3

Mount Aspiring land features

Mt. Aspiring national park has some features that are rough and jagged and some that are smooth and round. This is because there are different forces that shape the land.

External Forces

Glaciation

Glaciers are formed when snow builds up into layers which turns into Ice and the ice becomes thicker until gravity brings it down, new snow is added all the time. This makes the glacier advance (it gets bigger). When there is no snow falling, the glacier retreats (it gets smaller). Where the Ice collects is very important. The ice pushes downwards and rotates, carving a hollow called a cirque. When the Ice melts some of it fills the hollow forming a lake called a Tarn.

While the glacier is forming it cuts deep U-shaped valleys into the mountain. These valleys have high walls that are scratched because of rocks pushed on the side of the Glacier. The freeze thaw consists of droplets of water, finding their way into cracks and cravasses and the water expands when it freezes so the frozen water in the cracks expands the rocks and makes the cracks deeper and wider. The Glaciers also shape some mountains into sharp, pointed, pyramid-shaped mountains (sharks tooth mountain).

Rivers

Rivers tend to round the landscape. This is done because rivers break off and wear away rocks. It carries the broken off bits of rock that have been eroded from the slopes and deposits the particles when it doesn't have enough power to carry them any further. The smaller particles travel further than the larger ones.

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Because of this, large rocks and boulders are only moved when there is a flood. Streams also do this but on a smaller scale. The U-shaped valley walls cause rainfall to flow into the main river. This means floods are common. Small streams create Alluvial fans, which is when debris is carried down the stream and then spread on the valley floor. Places where rivers are eroding are usually worn down and rounded.

Internal Forces

Tectonics

When Tectonic plates come into contact with each other many different reactions are possible. One outcome is the plates buckling during contact, which causes mountains and valley formation. This is how the southern alps were formed. Without this, the Matukituki valley would not have been formed. Relief is how the land is shaped because of the Tectonic forces applied to the region. The South Island was the result of the Indo Australian and the Pacific plates colliding slowly under huge amounts of pressure which caused the uprising of land. One of the results of Tectonics is earthquakes. Earthquakes shake the land, causing landslides and displacement.

Discussion

When a place has multiple forces acting on it it can create special scenery. That is why the area is a national park. The Tectonic forces also sometimes produce valuable metal that people want, and this is why the Government is thinking about mining National parks. The forces mentioned above create both good scenery and the valuable resources.

	Grade Boundary: High Achieved
4.	This report is a High A because it is just a series of descriptions of the features in the area. Minor errors exist eg: “internal processes are the sharp steep cliffs…..” The cliff is an external process. The report gets the A because it covers both external processes; glaciation and river erosion.

Mount aspiring

4

During my trip to the mount aspiring region I noted many astounding surface features created by internal (under the ground) and external (above the ground) processes.
Towering mountain peaks, steep jagged cliffs, massive chalk white glaciers, sparkling sands, and shingle filled rivers.

The feature of the region that stands out the most is the tall, uneven mountains.
These are formed by tectonic uplift under the ground.
Mountains such as sharks tooth are formed when the pacific, and indo Australian plates clash together and cause the rock to rise above the ground. This process is called uplift.

Another feature of the region caused by an internal process are the sharp, steep cliffs that are seen everywhere around the valley, like the ones at wishbone falls.
These are originally formed as part of the mountain but faults (not to be confused with plate boundaries) which are weak parts in the rock, cause some of the mountain to slip off and create a steep rock wall

The awe-inspiring 'U' shaped Matukituki valley was caused by an external process
When rain falls high in the mountains it is frozen and compressed into a single entity. This is how a river of ice, or glacier is created.
Glaciers make their way, slowly down the mountains, pulverising any rock that gets in their way.
Glaciers once made their way down the Matukituki valley, thousands of years ago, before receding and exposing the massive, steep walls of the newly born valley

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The glaciers that created the valley would also later grind up against rock higher in the mountains breaking it down into tiny particles, often referred to as glacial flour. These tiny particles are carried down the mountains by the constant flow of water out of the glacier, or by rain water, which joins up with a nearby river, or stream. These tiny particles are then deposited where the water is shallow or where there is a weak current. This creates shingle fans which can also be seen numerously in the valley

Another dominant feature of the valley, formed by an external process is the fast flowing Matukituki River.
The river was originally formed by rain, which created channels in the path of least resistance, which in this case is the softest rock. The rain would also freeze and create small glaciers which carved through the rock and made a path for the river to flow through. These new rivers that have been created are fuelled by both the constant stream of water running out of the glaciers, or by rain water.

This amazing part of the world has been changing constantly for thousands of years, and will continue changing for thousands more. I truly hope these are only physical changes, which have naturally occurred because it would be a pity to spoil such a beautiful place that I hope is enjoyed by generations to come.

	Grade Boundary: Low Achieved
5.	This report is a Low Achieved. The student has just described a series of internal and external features. Has made some key errors in evidence selected. The area is not subject to subduction yet that is stated as their key internal process. River erosion and glaciation are mentioned as external processes but are only a series of descriptions and not explained or linked.

How the Matukituki Valley was formed

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All the features of the Mt Aspiring Park and Matukituki Valley are due to two main processes, internal and external processes. Internal processes are what goes on below the earths surface and external processes are what goes on, on the earths surface. The internal process that formed the matukituki valley is called tectonic activity which includes subduction, faulting and folding. And the external processes are glaciation, and erosion.

Tectonic activity was the first process that happened out of the three main processes and without it the other two couldn't have happened .The Matukituki Valley was formed from the South Island swelling due to the Indo Australian plate and the pacific plate colliding leaving no place for the land to go but up.

These plates only move the rate that your fingernails grow but because of the massive size and weight of both plates when they slip and rub against each other they let out a massive amount of pressure called an earthquake. These earthquakes sometimes cause small cracks (joints) and large cracks (faults) in rock to appear. Then the cracks are made bigger by water getting in them and then freezing making the crack even bigger. The cracks, if large enough eventually will have water running through it on the surface. This was how the Matukituki valley was formed and it would have looked like a v shaped valley before there were glaciers.

Glaciers gave the valley the U shape it has now. Glaciers are formed from snow at the top of mountains compressing and forming ice which gravity pulls down the mountain getting bigger and bigger bringing rocks and other things with it. When it goes down unlike a river which chooses the path of least resistance it goes the way that gravity pulls it and bulldozes debris with it. These debris are deposited on the sides of the valley. This is called a lateral moraine. And when a glacier retreats the debris are deposited on the valley floor wherever the glacier stopped. This is called a terminal moraine. Some examples of glaciations in the Matukituki valley is Sharks Tooth peak which is very steep at the top then curves into a bowl shape because of the freeze thaw process and the weight of the glacier another example of glaciations in the Matukituki valley is the Matukituki valley itself which was carved by a glacier giving it steep walls and a flat floor.

The last process that shaped the valley is erosion. There are types of erosion, wind erosion flowing water erosion (rivers and streams), and freeze thaw erosion. Wind erosion hasn't had much effect on the valley. Freeze thaw is when water gets in cracks then freezes to ice expanding 9% making an even bigger crack causing some rocks to break off piling up to form a scree which is basically a loose pile of rocks that have broken off and have fell or rolled to where they are now. Rivers created features in the Matukituki valley like alluvial fans and deep plunge pools like at Wishbone falls. It did this by just moving things (alluvium) downstream then depositing them further down.

All of these processes made the valley how it is today and without even one of them the valley would have looked completely different and wouldn't have some of the awesome features that it has now.

	Grade Boundary: High Not Achieved
6.	This report does not answer the question set. It contains a lot of information that is irrelevant to the question asked. Volcanic activity in the North Island and fossil fuels are not required. The paragraph in internal forces “Tectonic forces, volcanic rocks …..” is totally wrong. A glacial feature and a river erosion feature are included but not related to this report as they do not describe the external forces to the landscape features seen. The paragraph on erosion and weathering is not required.

Tectonics in NZ

6

New Zealand is located on the rim between two tectonic plates, the Pacific plate and the Australian plate. The location at the plate rim results in volcanism all around the islands, especially on the North Island. New Zealand is part of the ring of fire around the Pacific Ocean. Volcanoes erupt now and then, most famous is a young island which formed at the coast of New Zealand some decades ago. The more moderate volcanism produces heat energy and electricity in numerous hydrothermal power plants on the North Island. And some of this volcanic places are famous tourist destinations, like Waiotapu Geothermal Area, Rotorua, on North Island.

The extremely efficient use of volcanuic energy on North Island, and the enormous amount of water power on South Islands is big enough to provide all needed electricity. New Zealand does not import fossil energy to produce electricity, they only use renewable sources. Of course they are not autarc, as they need petrol for their cars and for heating.

Beneath volcanism there are numerous other processes connected with the location of the islands at active plate rims. Although the plates do not really collide, the forces have an narrowing component which was the force which built the Southern Alps. The Australian plate is more rigid and it moves norteast, the Pacific plate moves southwest. The rim runs nearly north-south, more or less parallel to the west coast of South Island.

So the two forces do not meet frontal, but somewhat diagonal, which splits the force into two components. The frontal component works rectangular to the plate rim, compresses the rocks, bends them upwards and produces thus a continual uplift which formed the Alps. The lateral component makes the two plates move along each other, which is is called strike-slip. This lateral movement produces earthqakes from time to time.

Tectonic forces, volcanic rocks and schists and crystalline rocks uplifted by the orogeny, there are also many sedimentary rocks. Among those rocks are numerous limestones and marbles which are karstified. Because of the complicated geology of New Zealand, they form small patches, all over the islands.

Cirques

Rob Roy Glacier is a cirque glacier.

A cirque is carved in the mountain by the glacier it contains. The cirque has a back wall against the peak which, is very steep. The floor is scooped out by glacial erosion and may be lower than the lip over which the glacier moves down the mountain face. Often, as here, the glacier falls as an avalanche over the cirque's lip to create a heap of

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avalanche snow which may itself consolidate to form the start of another glacier. This can also be seen on Mt Aspiring where the Bonar Glacier is formed by avalanche snow plus ordinary snowfall. Mt Aspiring shows what happens when several cirques carve back into the peak to leave it standing as a horn, with sharp ridges.

Eventually, after an ice age, even the cirque glaciers melt. The lip of the cirque then acts as a dam holding a cirque lake high in the mountains.

Alluvial fan

An alluvial fan is a fan-shaped deposit where a fast flowing stream flattens. Plants often are concentrated at the base of alluvial fans and many have long tap roots (30-50 feet) to reach water. The long-rooted plants are called phreatophytes by biologists. The water at this level is derived from water that has seeped through the fan and hit an impermeable layer that funneled the water to the base of the fan where it is concentrated and sometimes forms springs and seeps if the water is close enough to the surface. These stands of bushes cling onto the soil at their bases and over time wind action often blows away sand around the bushes which forms islands of habitit for many animals.

Erosion and weathering

Weathering takes place as rocks are broken down into progressively smaller pieces by the effects of weather. These pieces do not move to a new location, they simply break down, but remain next to one another.

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smaller pieces, until finally there are many tens of thousands of small rocks. Often rocks are broken down so much that they become dirt. Weathering is caused by water, as it freezes and thaws, as well as by chemical reactions that loosen the bonds holding rocks together.